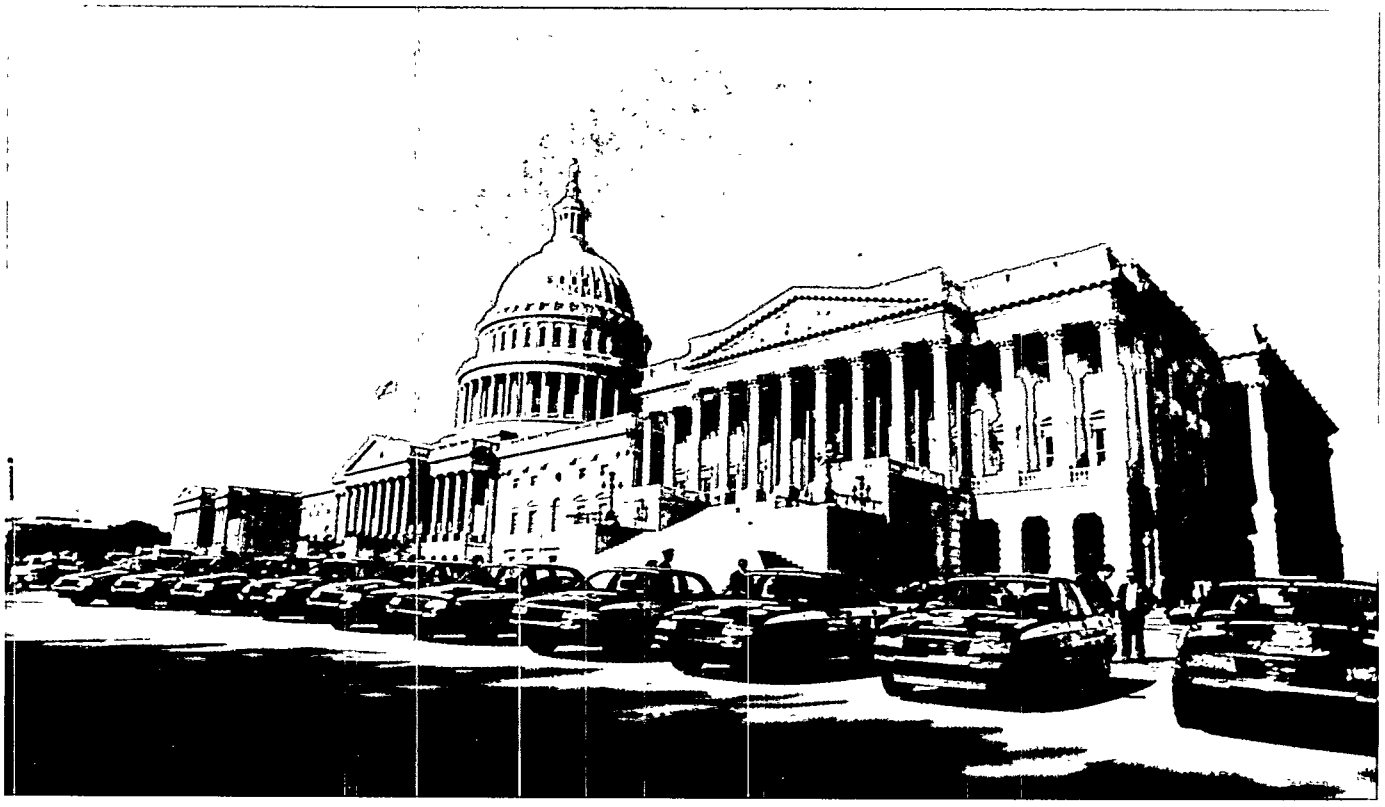

The 1989 Methanol Marathon, jointly sponsored by the Society of Automotive Engineers and DOE, was run from Detroit, Michigan, to Washington, D.C.

High-Temperature Liquid Lubricants

Lubricating oils that perform effectively in the harsh environments of high-temperature processes are considered major advances. The high-temperature liquid lubricants being developed under DOE's Heavy Duty Transport Technology Program will enable top ring reversal temperatures to be increased to nearly 500°C, more than double the capability of conventional lubricating oils. The new lubricants could also dramatically reduce particulate emissions; this is an important characteristic because recent data indicate that 30% to 60% of particulate emissions emanate from the lubricating oils currently in use. The new synthetic lubricant is being developed with an additive to decompose the oil cleanly, forming less soot and emitting fewer particulates. The new lubricants also have lower ash formation, which should reduce engine wear and emissions. Finally, the new oil allows engine operation in a temperature range three times that of conventional oils. Laboratory formulation of the lubricants was completed and engine testing began in late 1989.

Spark Plug Instrumented with Fiber Optics

Currently, there are about 130 million vehicles with internal combustion engines on U.S. highways, consuming about 20 quads of fuel annually at efficiencies ranging from 19% to 26%. Given this magnitude of fuel consumption, even modest improvements in the efficiency of these engines could yield considerable energy savings. Understanding the physical and chemical processes that control combustion is critical to improving the fuel efficiency and environmental acceptability of gasoline and diesel engines.

A critical issue in the development of fuel-efficient engines is the characterization of the dynamics of flame growth and the mechanical behavior of fluids. Rough idling, for example, can be influenced by cyclic fluid variability on flame development in the